PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	**Eugene Pikus, David Nohre**
Application No.:	**10/733499**
Filed:	**December 10, 2003**
For:	**RF DATA COMMUNICATIONS LINK FOR SETTING ELECTRONIC FUZES**
Examiner:	**Michelle Renee Clement**
Group Art Unit:	**3641**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Docket No.: A39.2B-11304-US01

REPLY BRIEF

This is a Reply Brief for the above-identified Application in which an Examiner's Answer was mailed on April 30, 2008.

Status of Claims

Claims 1-18 and 21-26 are pending in this application. Claims 19 and 20 have been cancelled.

Claims 1-18 and 21-26 stand rejected and are the subject of this appeal. Specifically, the Final Office Action rejected claims 1-14, 16-18 and 21-24 under 35 USC § 103 over Cumming (US 4144815) in view of Keil (US 6176168); and rejected claims 15, 25 and 26 under 35 USC § 103 over Cumming in view of Keil and further in view of Koerner (US 4495851).

Grounds of Rejection to be Reviewed on Appeal

Issue 1: Whether the Examiner erred in rejecting claims 1-14, 16-18 and 21-24 under 35 USC § 103 over Cumming (US 4144815) in view of Keil (US 6176168).

Issue 2: Whether the Examiner erred in rejecting claims 15, 25 and 26 under 35 USC § 103 over Cumming in view of Keil and further in view of Koerner (US 4495851).

(vii) Argument

Issue 1: Whether the Examiner erred in rejecting claims 1-14, 16-18 and 21-24 under 35 USC § 103 over Cumming (US 4144815) in view of Keil (US 6176168).

In this Reply Brief, Applicants submit remarks intended to clarify previous assertions and respond to the arguments presented in the Examiner's Answer.

Expectation of Success

Applicants previously argued that the Examiner's proposed combination does not present a reasonable expectation of success because the prior art of record does not teach a fuze that is capable of receiving and interpreting dual Cumming and Keil signals, which each include commingled power and data.

The Examiner has responded that Cumming and Keil are known alternative devices, and that "simple substitution of one known, equivalent element for another element…would have yielded predictable results…and there would have been a reasonable expectation of success." See Examiner's Answer at pages 7-8.

The Examiner's argument does not apply to the Examiner's proposed combination. The rejection does not propose simple substitution of elements in Cumming for Keil, or vice versa. The rejection proposes to combine Cumming and Keil in a way that uses both methods at the same time. The prior art of record does not disclose or suggest a fuze structure that is capable of receiving and resolving the dual commingled signals.

With respect to the power transmission, Cumming teaches a "power source 42 which is adapted to convert the CW [continuous wave microwave signal] energy into a DC voltage which is stored." See column 3, lines 11-15. Keil teaches a circuit and power source capable of converting the Keil inductive signal to power. See e.g. Figure 13 and column 4, lines 53-61. Thus, Cumming and Keil each disclose power transmission via a particular medium and teach a system capable of receiving power via that particular medium. However, the prior art of record does not teach a singular power system that is capable of receiving power via both the Cumming and Keil mediums simultaneously.

With respect to data transmission, Cumming teaches a fuze having a microwave filter 44 and binary counter 46 specifically designed to extract the fuze setting data from the

modulated microwave signal. See Figure 2 and column 3, lines 3-7. Keil teaches a fuze capable of extracting fuze setting data from the modulated inductive signal. See e.g. Figures 7-9 and 13, and column 4, lines 15-36. Thus, Cumming and Keil each disclose data transmission via a modulated signal of a particular medium, and each teach a system capable of extracting setting data from that particular signal medium. In either case, there is only one incoming stream of setting data to be received by the fuze.

The prior art of record does not teach a fuze capable of receiving setting data from two incoming data streams over alternate mediums simultaneously. A person of ordinary skill in the art would recognize that the Examiner's proposed combination would require some new structure capable of receiving and interpreting the dual signals. Merely adding Cumming parts the Keil device would not result in a working system. The prior art of record does not teach a fuze capable of resolving two separate sets of programming data into a unitary programming instruction, and the rejection does not address problems that would result if the two sets of programming data were inconsistent with one another.

Therefore, Applicants assert that the Examiner's proposed combination of the Cumming and Keil structures and methods does not present a reasonable expectation of success, and a person of ordinary skill in the art would not have been motivated to make such a combination.

Hindsight/Reason to Combine or Modify

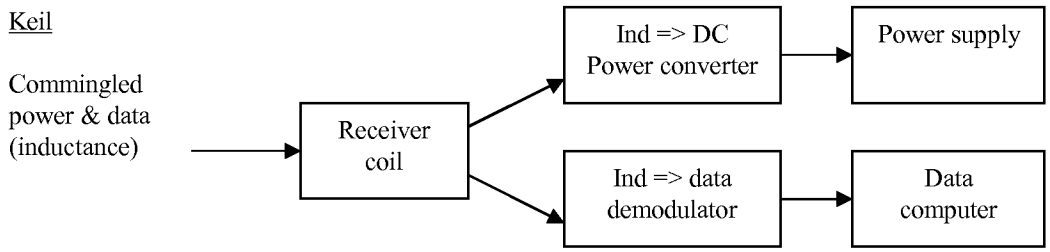
Applicants previously asserted that the Examiner's reason for proposing the combination of Cumming and Keil appears to stem from an impermissible hindsight attempt to meet Applicants' claims. In the Answer, the Examiner argues that the proposed modification would allow "transmitting more information" and "faster firing." See Answer at pages 4-5. Applicants respond to both assertions below, noting that the "faster firing" argument was first presented in the Examiner's Answer.

The Examiner asserts that the proposed combination would allow "transmitting more information." Although the proposed combination would result in a greater total number of bits of information being transmitted, the additional data would be purely cumulative when compared to the Keil method. The proposed combination would result only in redundant and

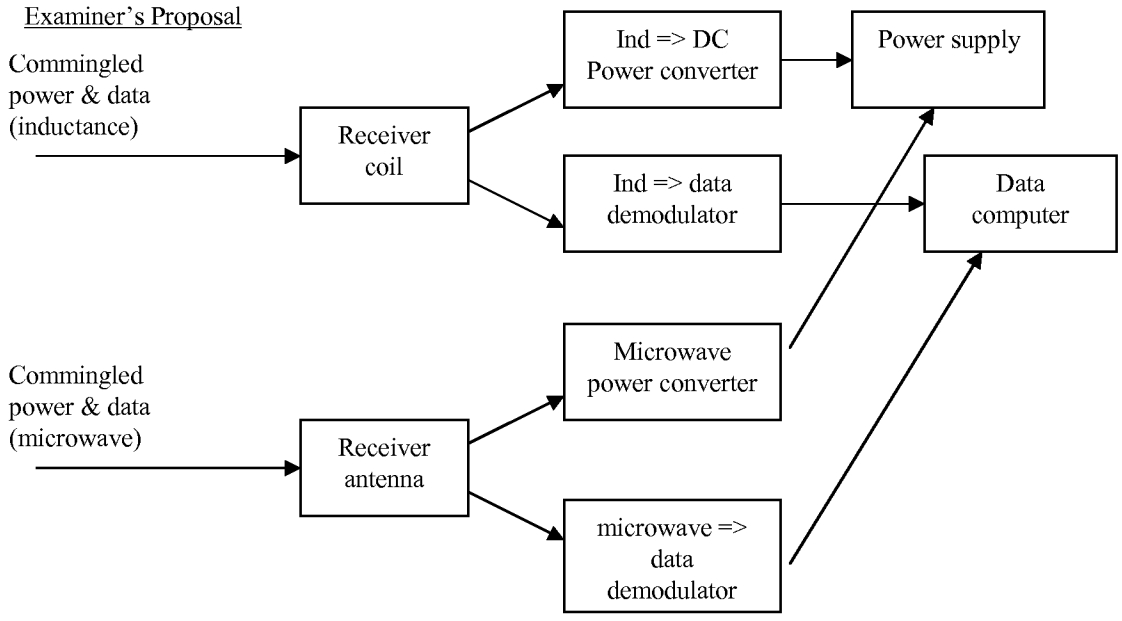
unnecessary data transmission.

The practical structural requirements of the proposed combination would deter a person of ordinary skill in the art from making the proposed combination, as the costs of the combination would outweigh any benefit of the cumulative/redundant setting data transmission. The following diagrams are presented only for the sake of argument – they do not comprise any admission that the proposed combination would be functional.

Applicants show below a block diagram illustrating the components that are required in the fuze for the Keil method of powering and programming via a modulated inductive signal. The blocks include a receiving coil; an inductive-to-DC power converter; a power supply; a demodulator capable of extracting setting data from the modulated inductive wave, and a data computer.



A similar diagram is shown below illustrating the components required of a fuze in the Examiner's proposed combination – more items are required.



In the Examiner's proposed combination, the fuze would need all of the parts required in the Keil fuze. The Examiner's fuze would further require an antenna for receiving the Cumming commingled microwave signal, a microwave-to-DC power converter and a demodulator capable of extracting setting data from the modulated microwave signal. [Applicants previously asserted that the prior art of record does not teach a fuze capable of receiving the dual power or dual setting data simultaneously, and the above diagram is not an admission that the Examiner's combination could function.]

Thus, the fuze required for the Examiner's proposal requires more parts than are required of the Keil fuze. The additional components would add cost and complication, and would further be detrimental to projectile performance. A person of ordinary skill in the art would recognize the need for projectile fuze components to be as small and light as possible, as any additional weight or size in a fuze is detrimental to projectile ballistics. The fuzes must be equal to or less than the diameter of the explosive to which they are secured, and the diameter of the explosive is constrained by the size of the barrel and applicable military standards.

A person of ordinary skill in the art would not be motivated to make the Examiner's proposed combination for the purpose of transmitting redundant/duplicative information in light of the structural requirements of a fuze that would be capable of receiving such information. The costs and drawbacks associated with the additional fuze structure would outweigh any benefit provided by redundant setting information, and would therefore deter a person of ordinary skill in the art from making the proposed combination of Cumming and Keil.

Although the above diagrams show structure in a fuze – i.e. the receiving portion of the claimed system, it should be recognized that the Examiner's proposed combination would require similar additional parts in the fuze setter – i.e. the transmitting portion of the system.

With respect to the "faster firing" assertion in the Examiner's Answer, the Examiner alleges a time benefit associated with the proposed combination; however, any time benefit would be moderate at best, as the proposed combination requires full transmission of both types of setting data. Any time benefit associated with the Examiner's proposed combination would be a slight reduction in power-up time for the fuze. Such a slight benefit would be outweighed by the drawbacks of the additional fuze structure required, as asserted above.

Applicants have provided below timeline diagrams illustrating the time required for

powering/programming in the Cumming and Keil methods, and for the Examiner's proposed combination.

Time ==========>

Cumming method

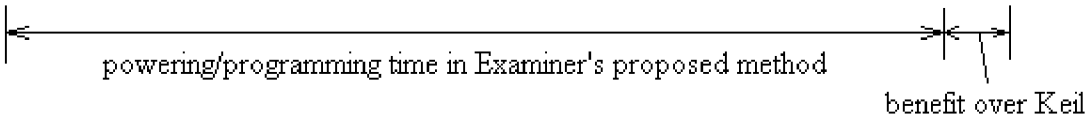
Microwave power up	Microwave modulated programming

Keil method

Inductive power up	Inductive modulated programming

Examiner's proposed combination

Dual microwave + inductive power up	Inductive modulated programming
	Microwave modulated programming



For both Cumming and Keil, Applicants have illustrated an initial continuous wave period ("power up") and a modulated programming period. The inductive "power up" in Keil's method is shown as smaller than the microwave "power up" in Cumming's method due to the efficiency of the inductive transmission for power delivery over microwave transmission of power. The microwave modulated programming period in Cumming's method is shown as smaller than the inductive modulation period in Keil's method due to the efficiency of microwave/RF transmission of data over inductive transmission of data.

For illustrating the timeline of the Examiner's proposed combination, Applicants have shown a reduction in the "power up" period required when compared to Keil, as power in the proposed combination would be transmitted by dual mediums. Any actual reduction in the time required to power the fuze, however, would be speculative. Applicants have asserted that the prior art of record does not teach a structure capable of receiving the dual power transmissions. Further, a person of ordinary skill in the art would recognize that in the Cumming

and Keil methods, power is being transmitted to the fuze during the entire programming cycle. Although there is an initial "power up" power-only period, the subsequent incoming modulated waveform that includes setting data still functions to add power to the fuze. Such power addition will continue either until the full electrical storage capacity of the fuze is reached, or until the incoming waveform terminates. Therefore, the minimum time required for placing adequate power in the fuze in either Cumming or Keil is speculative, and the "power up" time of the Examiner's combination is also speculative.

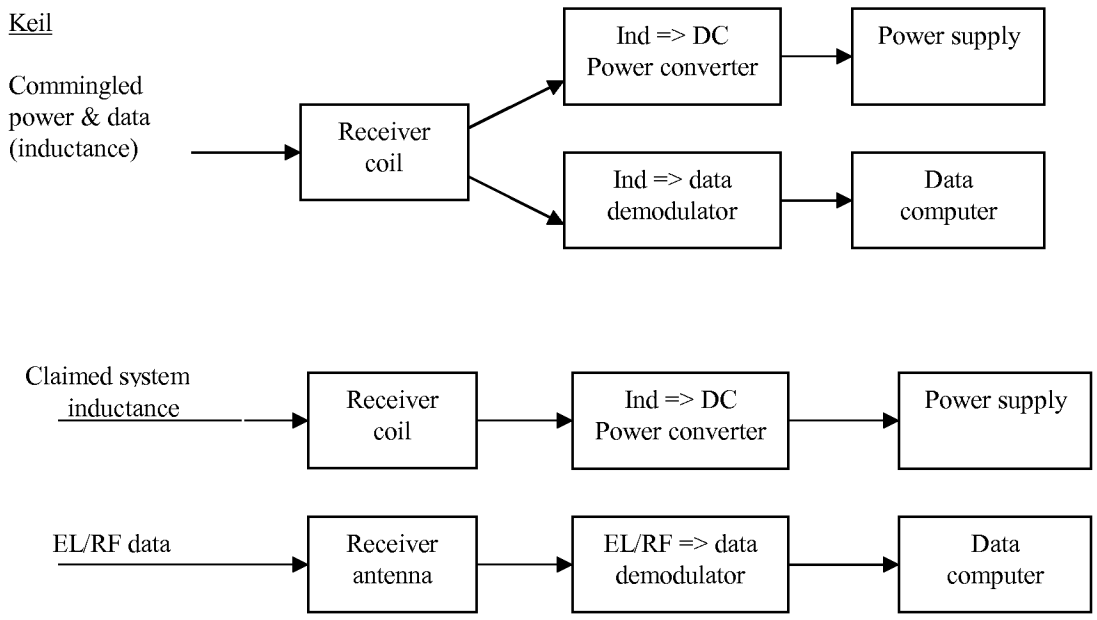
Even if the Examiner's combination presents a time benefit with respect to power, there will be no benefit with respect to the data transmission. Each medium of data transmission is identical to the data transmission in the original Cumming or Keil method. Therefore, the only time benefit associated with the Examiner's combination would be a speculative reduction in time based upon a reduction in the "power up" period.

A person of ordinary skill in the art would not be motivated to use the Examiner's proposed combination based upon a speculative reduction in the "power up" period, as the costs associated with the proposed combination would outweigh any benefit of the speculative reduction in powering time. As shown on page 6 herein, the components required of the fuze in the proposed combination would add structure and weight to the fuze. The detrimental effects and costs of the additional structure, over that of the fuze required in Keil's method, would outweigh the potential reduction in "power up" time.

Claimed Device

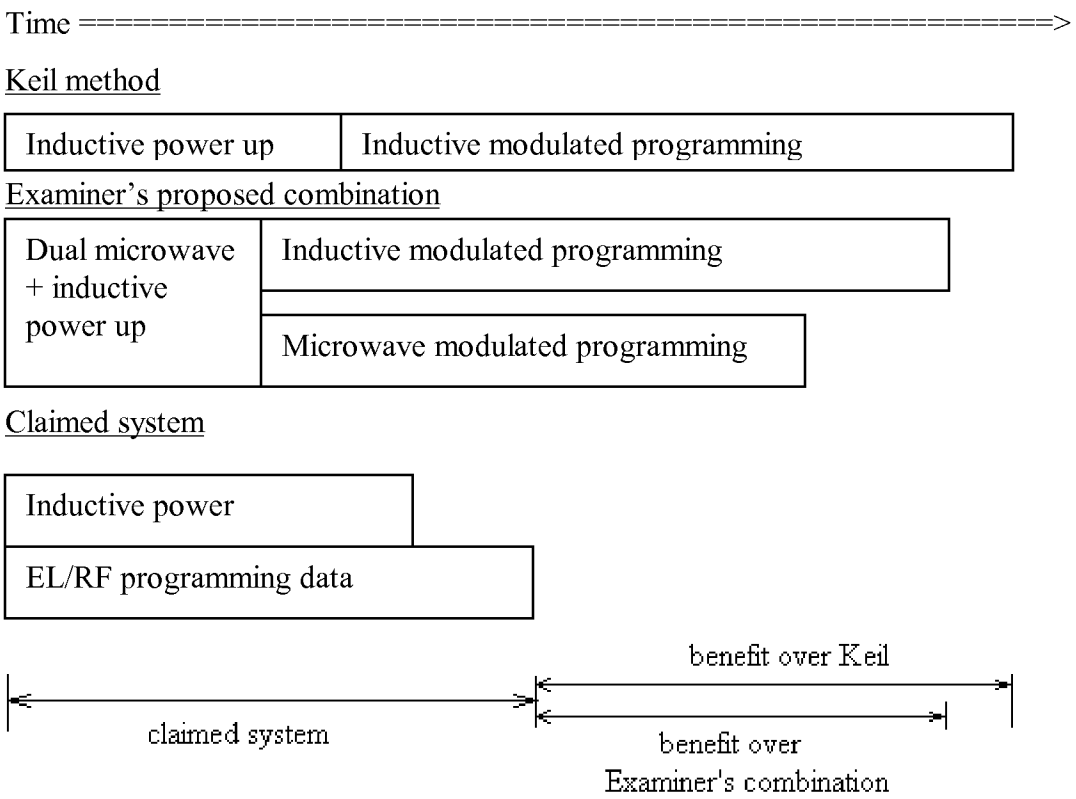
To show the benefits of Applicants' claimed system over both the prior art and over the Examiner's proposed combination, Applicants have provided a block diagram and a timeline for the claimed device below. These are similar to the diagrams and timelines presented above on pages 6 and 8.

With respect to fuze structure, Applicants compare the claimed fuze to the Keil fuze below.



The fuze of the claimed system includes some additional components over the Keil fuze, but is also able to omit some structure that is required in the Keil fuze. Power is transmitted by inductance, so the claimed fuze includes a receiver coil, an inductive-to-DC power converter and a power supply; however, the claimed fuze does not need to demodulate the inductive signal, so the demodulation structure from the Keil fuze can be omitted. The claimed fuze further includes an antenna or similar device to receive the electromagnetic/radio-frequency setting data, and a demodulator for that signal. Overall, the number of components in the claimed fuze more closely resembles the Keil fuze than the Examiner's proposed fuze as shown on page 6. Thus, the problems of additional structure that Applicants' have asserted in the Examiner's proposed combination do not apply to the pending claims.

The claimed system further presents a significant time benefit over the Keil method, and also over the Examiner's proposed method. Applicants provide timelines below showing the Keil method, the Examiner's proposed combination, and Applicants' claimed system on a similar scale.



As shown above, the claimed system presents a substantial reduction in the time required to power and program a fuze, as power and data are transmitted via separate mediums, and each medium is particularly suited for efficiency – inductance for power and electromagnetic/radio-frequency for data.

Suggestion to Person of Ordinary Skill in the Art

The Examiner repeatedly asserts that "the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." See e.g. Answer at page 9. Applicants assert that a person of ordinary skill in the art viewing Cumming and Keil would not have been motivated to combine them as proposed by the Examiner. Instead, they would have recognized that Keil represents an advancement in the state of the art over Cumming for multiple reasons, and would have simply used the Keil method and discarded the Cumming method as dated technology.

The Cumming method uses microwave transmission of energy. A person of ordinary skill in the art would recognize that human operators must be shielded from microwave

energy. In Cumming, the transmission of the microwave energy does not begin until the projectile is positioned in the gun barrel. A person of skill in the art would recognize that when the firing platform is a tank, the projectile would be secured in the firing chamber at the base of the barrel and sealed off from the human operators before microwave energy transmission would begin.

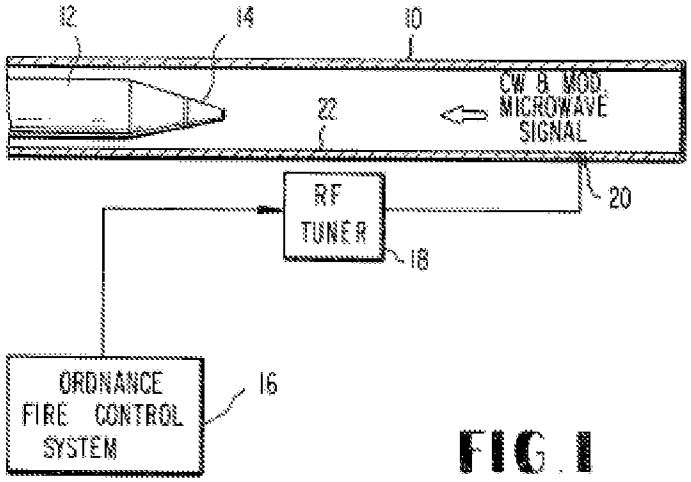


FIG. 1

As shown in Cumming Figure 1 above, the Cumming method uses an RF injector 20 positioned along the barrel 10 to transmit the microwave energy. The barrel 10 acts as a waveguide, guiding the microwave energy to the projectile 12 and fuze 14. See also column 2, lines 5-26.

When the Keil method is compared to the Cumming method, the Keil method is clearly superior. The inductive transmission of power and setting data is safe for the human operators. Therefore, the Keil fuze does not have to be placed in a chamber/barrel prior to transmission of power/setting data. The Keil fuze can be programmed by operators inside a personnel area of the tank before the projectile is chambered. This allows one projectile to be powered and set while another projectile is being fired, increasing the firing rate of the Keil system beyond the capabilities of the Cumming method.

In addition to the operator safety and firing rate benefits of Keil over Cumming, the localized Keil inductive signal is more difficult for an enemy to intercept than the Cumming microwave signal, which can escape out of the gun barrel to the battlefield environment.

Further, Keil teaches a "talkback" signal to verify the fuze setting data to reduce the occurrence of setting errors and duds. In view of the substantial benefits of Keil over

Cumming, and the fact that the Keil and Cumming are essentially alternatives/equivalents for one another, a person of ordinary skill in the art viewing the combined teachings of Cumming and Keil would be motivated to discard Cumming and use Keil, and would not attempt a combination of the two methods as proposed by the Examiner.

Additionally, these practical considerations expose a potential problem in the Examiner's proposed combination. Since the combination requires Cumming's microwave energy transmission along with Keil's inductive energy transmission, the rejection should at least address inconsistencies created by the proposal of using the two methods together. A person of ordinary skill in the art would recognize that if the Cumming signal is transmitted simultaneously with the Keil signal, starting from Keil's method wherein the fuze setter is typically located in a personnel compartment, the personnel would be exposed to the microwave signal/radiation. If instead the starting point is Cumming's method where the projectile is in the barrel, personnel would be shielded from the microwave signal but there are practical problems with positioning Keil's transmitter coil in proximity to the fuze. A person of ordinary skill in the art would not place any obstructions in the flight path of a chambered projectile. Further, such a configuration would negate Keil's rapid fire capability, as the programming must be done when the chamber/barrel are occupied, and the programming would delay firing.

Therefore, a person of ordinary skill in the art would not have combined Cumming and Keil as asserted by the Examiner, and Cumming in view of Keil does not render the rejected claims unpatentable as asserted by the Examiner. Applicants request that the Board reverse all rejections asserted by the Examiner applying Cumming in view of Keil.

Applicants further note that the claimed system does not expose personnel to dangerous levels of radiation because the electromagnetic/radio-frequency setting data signal does not transmit operational power. Therefore, the energy level of the setting data signal is significantly less than in Cumming's method, and is safe for human personnel.

Dependent Claim 3

The Examiner asserts that Keil's inductive coil "functions as an antenna" and therefore meets the "data transmitter having an antenna" limitations of claim 3; however, this assertion is inconsistent with the earlier characterizations of the inductive coil in the rejection.

The Examiner combines Cumming and Keil, asserting that Cumming teaches an antenna and Keil teaches power transmission via inductive coils. See Answer at pages 3-4. This characterization clearly draws a distinction between an "antenna" and an "inductive coil" in a way that is consistent with Applicants' language throughout the application, wherein "antenna" and "inductive coil" have different meanings. Since the rejection characterizes the Keil coil as an "inductive coil," and identifies a "coil" and an "antenna" separately in the prior art, the Examiner cannot assert that the previously characterized "coil" now has a different meaning solely for the purpose of rejecting claim 3.

Dependent Claims 4 and 11

The Examiner asserts that optimizing ranges involves only routine skill, however, the Examiner does not address the underlying problems at which the "transmitter within 6 inches of the receiver" was intended to reveal. Applicants have discussed practical problems with combining Cumming and Keil as proposed by the Examiner, namely a safety issue in exposing personnel to microwave energy if fuzes are programmed in a personnel compartment vs slower firing rates and negation of Keil's benefits if the fuzes are programmed in the barrel. These considerations are discussed herein at pages 12-13.

Dependent Claims 6 and 7

Dependent claim 6 recites structure that allows the "talkback" function recited in claim 7. Applicants note that the recited talkback is over the radio-frequency data link.

Keil teaches talkback over the inductive coupling. The Examiner has proposed to combine Keil and Cumming as discussed above, and for the rejection of claims 6 and 7, proposes to modify the combination further to establish a talkback signal over Cumming's microwave link. The Examiner has not provided any reason to perform the modification, which appears to stem only from a hindsight attempt to meet Applicants' claims. Keil already provides a talkback function, so the additional modification proposed to reject claims 6 and 7 is unnecessary and would only result in another redundant data transmission.

Further, Applicants have asserted above that the prior art of record does not teach a fuze that would be capable of receiving two incoming data streams and resolving them into a

single programming instruction. Similarly, the prior art of record does not teach a fuze that would be capable of receiving two talkback signals via different mediums simultaneously, or of resolving the talkback signals into a single talkback verification.

Dependent Claim 16

The Examiner's assertion for claim 16 is similar to the assertion made for claim 7. Applicants similarly assert that the Examiner has not provided any reason to perform the modification other than a hindsight attempt to meet Applicants' claims, that there is no reason to duplicate a talkback signal over the Examiner's original combination, and that the prior art does not teach a fuze capable of receiving and interpreting the duplicative talkback signals.

Issue 2: Whether the Examiner erred in rejecting claims 15, 25 and 26 under 35 USC § 103 over Cumming in view of Keil and further in view of Koerner (US 4495851).

The Examiner states that Koerner is relied upon for the teaching of simultaneous transmission of operational power and fuze setting data. See Answer at page 11.

Koerner teaches transmission of a microwave energy signal and a microwave data signal. See e.g. column 3, lines 1-6. Thus, the "simultaneous transmission" taught by Koerner is simultaneous transmission of microwave power and microwave data.

The teachings of Koerner do not meet the limitations of claims 15, 25 or 26, which require the simultaneous transmission of the operational power and fuze setting data recited in a previous claim. Claim 15 depends from claim 1, which recites inductive power transmission. Similarly, claim 26 depends from claim 21, which recites operational power via an inductive signal.

The prior art of record does not disclose or suggest transmission of power via an inductive waveform and simultaneous data transmission in another medium, such as by "an electromagnetic signal selected from a group consisting of the infrared, RF, visible and UV bands of the electromagnetic spectrum" as recited in claim 1 or by a "radio signal" as recited in claim 21.

The Examiner admits that the proposed combination of Cumming and Keil does not expressly disclose energy and data transmitted simultaneously. See Answer at page 6. The Koerner reference, in teaching simultaneous transmission of power and data via microwave energy, does not provide any motivation to modify Cumming and Keil in a way that would result in a system/method that meets the limitations of the rejected claims. Therefore, Applicants request that the Board reverse the Examiner's rejections applying Cumming in view of Keil and further in view of Koerner.

Conclusion

In view of the foregoing remarks, Applicants request that the Board reverse all of the rejections asserted by the Examiner.

Respectfully submitted,

VIDAS, ARRETT & STEINKRAUS

Date: June 30, 2008

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